

CHAPTER XI

Special Types: Exhaust-steam, Mixed-pressure, Back-pressure, and Pass-out Turbines

The previous chapters have dealt mainly with steam turbines of the high-pressure condensing type. Four other types, differing in the pressure range utilized, are as follows:

1. Low-pressure or exhaust-steam turbines with steam admission at about atmospheric pressure and exhausting into a condenser.
2. Mixed-pressure turbines combining the functions of (i) with those of a high-pressure condensing turbine.
3. Back-pressure turbines with steam admission at high pressure, and exhausting against atmospheric pressure or higher pressure.
4. Pass-out turbines, which combine the functions of (3) with those of a high-pressure condensing turbine.

Exhaust-steam Turbines. — The most usual function of a low-pressure turbine is to utilize the steam exhausted from one or more non-condensing reciprocating engines. If these engines, either from their design, the nature of their work, or the low initial steam pressures, are uneconomical, as is very often the case, then the exhaust steam may yield more power in the turbine than the output of the engines. If, as in a few cases, no extra power is required, then the result of adding the exhaust-steam turbine is to reduce the demand for steam by 50 per cent or more.

Taking next the case of a reciprocator working, condensing, and having an output of 1000 b.h.p. and a steam consumption of 16 lb. per brake horse-power hour. If this engine is arranged to exhaust to atmosphere, which can usually be effected without loss of output, and if its steam consumption is thereby increased by 25 per cent, i.e. to 20 lb. per brake horse-power hour, then an exhaust-steam turbine having a consumption of, say, 25 lb. per brake

horse-power hour will give an output of = 800 h.p. The over-

all steam consumption is thus reduced from 16 lb. per
brake horse-power
hour to 11.1 lb., an improvement of just over 30 per cent. If
the additional
power made available can be effectively utilized, the capital
expenditure
involved will be fully justified.

Sir Charles Parsons recognized the savings to be obtained in this manner, and built a number of exhaust turbines in the nineties of last century.

Exhaust-steam Accumulators. — The exhaust turbine, however, received its greatest impetus from the invention by Professor Rateau of the exhaust-steam accumulator, the interposing of which between engines and turbine makes it possible for a low-pressure turbine to draw a constant supply of steam while the reciprocating engines are exhausting widely fluctuating